

09/914886
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CHAPTER II

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

<u>PCT/FI00/00145</u>	<u>23 February 2000 (23.02.00)</u>	<u>16 March 1999 (16.03.99)</u>
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED

COOLING ELEMENT FOR A HEATER EXCHANGE

TITLE OF INVENTION

Per SANDBERG (Västerås, Sweden)

APPLICANT(S)

Assistant Commissioner for Patents

Box PCT

Washington, D.C. 20231

Attention: EO/US

1. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 USC 371:
 - A. [x] This express request to immediately begin national examination procedures (35 USC 371(f)).
 - B. [x] The U.S. National Fee (35 USC 371(c)(1) and other fees (37 CFR 1.492) indicated in the attached fee calculation sheet.

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2. ☒ A copy of the International application as filed [35 USC 371(c)(2)]:
- a. ☐ is transmitted herewith.
 - b. ☐ is not required as the application was filed with the United States Receiving Office.
 - c. ☒ has been transmitted
 - i. ☒ by the International Bureau. Date of mailing of the application (from form PCT/IB/308): 21 September 2000 (21.09.00).
 - ii. ☐ by applicant on (date) _____.
3. ☒ A translation of the International application into the English language [35 USC 371(c)(2)]:
- a. ☐ is transmitted herewith.
 - b. ☒ is not required as the application was filed in English.
 - c. ☐ was previously transmitted by applicant on (date) _____.
 - d. ☐ will follow (within 32 months of earliest priority date).
4. ☒ Amendments to the claims of the International application under PCT Article 19 [35 USC 371(c)(3)]:
- a. ☐ are transmitted herewith.
 - b. ☐ have been transmitted
 - i. ☐ by the International Bureau. Date of mailing of the amendment (from form PCT/IB/308): _____.
 - ii. ☐ by applicant on (date) _____.
 - c. ☒ have not been transmitted as
 - i. ☒ applicant chose not to make amendments under PCT Article 19. Date of mailing of Search Report (from form PCT/ISA/210): 12 July 2000 (12.07.00).

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- ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.
5. ☒ A translation of the amendments to the claims under PCT Article 19 [35 USC 371(c)(3)]:
- ☐ is transmitted herewith.
 - ☐ is not required as the amendments were made in the English language.
 - ☒ has not been transmitted for reasons indicated at point 4c above.
6. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409)
- ☒ is transmitted herewith.
 - ☐ is not required as the application was filed with the United States Receiving Office.
7. ☒ Annex(es) to the International Preliminary Examination Report
- ☒ is/are transmitted herewith.
 - ☐ is/are not required as the application was filed with the United States Receiving Office.
 - ☐ is/are not being transmitted as there is/are no Annex(es).
8. ☒ A translation of the annexes to the International Preliminary Examination Report
- ☐ is transmitted herewith.
 - ☒ is not required as the annexes are in the English language.
 - ☐ is not being transmitted for the reason indicated at point 7c above.
9. ☒ An oath or declaration of the inventor [35 USC 371(c)(4)] complying with 35 USC 115
- ☐ was previously submitted by applicant on (date) _____.
 - ☐ is submitted herewith and such oath or declaration

- i. ☐ is attached to the application
- ii. ☐ identifies the application and any amendments under PCT Article 19 which were transmitted as stated in points 4a or b; and states that they were reviewed by the inventor as required by 37 CFR 1.70.
- c. ☒ will be provided in response to a Notice to File Missing Requirements.
10. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☐ is transmitted herewith.
- b. ☒ has been transmitted by the International Bureau. Date of mailing (from form PCT/IB/308): 21 September 2000 (21.09.00).
- c. ☐ is not required as the application was searched by the United States International Searching Authority.
- d. ☐ will be transmitted promptly upon request.
- e. ☐ has been submitted by applicant on (date) _____.
11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98:
- a. ☐ is transmitted herewith.
- Also transmitted herewith is
- ☐ Form PTO-1449
- ☐ Copies of citations listed
- b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 USC 371(c).
- c. ☐ was previously submitted by applicant on (date) _____.
12. ☐ The applicant claims small entity status with respect to this application.
- ☐ A Verified Statement Claiming Small Entity Status is attached.
- ☐ The undersigned claims small entity status on behalf of the applicant.

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13. ☐ An assignment document is transmitted herewith for recording. A separate ☐ "RECORDATION COVER SHEET" is also attached.


14. ☒ Additional documents

- a. ☐ Copy of request (PCT/RO/101)
- b. ☒ International Publication No. WO 00/55560
- i. ☐ Specification, claims and drawing
- ii. ☒ Front page only
- c. ☒ Preliminary amendment
- d. ☒ Abstract
- e. ☐ Other

15. ☒ The above checked items are being transmitted

- a. ☒ before 30 months from any claimed priority date.
- b. ☐ after 30 months but before 32 months (surcharge and/or processing fee included) from any claimed priority date.

16. ☐ Certain requirements under 35 USC 371 were previously submitted by the applicant on _____, namely:


 John Smith-Hill
 Reg. No. 27,730

SMITH-HILL & BEDELL, P.C.
 12670 N.W. Barnes Road, Suite 104
 Portland, Oregon 97229

(503) 574-3100

202010-98841660

FEE CALCULATION SHEET

Entry into National Phase of PCT/FI00/00145

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
[x]	TOTAL CLAIMS	10	-20 =	0 x \$ 18 =	\$ 0
	INDEPENDENT CLAIMS	1	- 3 =	0 x \$ 80 =	\$ 0
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270 =	\$ 0
BASIC FEE	<p>[] U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO:</p> <p>[] and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national state (37 CFR 1.492(a)(4)) \$100</p> <p>[] and the above requirements are not met (37 CFR 1.492(a)(1)) \$690</p> <p>[x] U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO:</p> <p>[] has been paid (37 CFR 1.492(a)(2)) \$710</p> <p>[x] has not been paid (37 CFR 1.492(a)(3)) \$1,000</p> <p>[] where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) \$860</p>				1,000
OTHER FEES	Surcharge of \$130 for furnishing the oath or declaration later than 30 months (but no later than 32 months) from any claimed priority date (37 CFR 1.492(e) and 37 CFR 1.495(c)).				+
	Total of above Calculations				= 1,000
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				1,000
	Processing fee of \$130 for furnishing the English Translation later than 30 months (but not later than 32 months) from any claimed priority date (37 CFR 1.492(f) and 37 CFR 1.495(c)).				+
	Basic National Fee				\$ 1,000
	Fee for recording the enclosed assignment document \$40 (37 CFR 1.21(h)).				+
TOTAL	TOTAL FEES ENCLOSED				\$ 1,000

* See attached Preliminary Amendment.

- [x] A check in the amount of \$1,000 to cover the basic filing fee is enclosed.
- [x] Please charge any additional basic filing fees under 37 CFR 1.492(a) which may be required by this paper, or credit any overpayment to Deposit Account No. 19-2560. This sheet is filed in duplicate.

Penelope Stockwell
Penelope Stockwell

09/914886-010702

FEE CALCULATION SHEET
Entry into National Phase of PCT/FI00/00145

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULA- TIONS
[x]	TOTAL CLAIMS	10	-20 =	0 x \$ 18 =	\$ 0
	INDEPENDENT CLAIMS	1	-3 =	0 x \$ 80 =	\$ 0
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)				\$ +270 = 0
BASIC FEE	<p>[] U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO:</p> <p>[] and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national state (37 CFR 1.492(a)(4)) \$100</p> <p>[] and the above requirements are not met (37 CFR 1.492(a)(1)&(6)) \$690</p> <p>[x] U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO:</p> <p>[] has been paid (37 CFR 1.492(a)(2)) \$710</p> <p>[x] has not been paid (37 CFR 1.492(a)(3)) \$1,000</p> <p>[] where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(6)) \$860</p>				1,000
OTHER FEES	Surcharge of \$130 for furnishing the oath or declaration later than 30 months (but no later than 32 months) from any claimed priority date (37 CFR 1.492(e) and 37 CFR 1.495(c)).				+
	Total of above Calculations				= 1,000
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				1,000
	Processing fee of \$130 for furnishing the English Translation later than 30 months (but not later than 32 months) from any claimed priority date (37 CFR 1.492(f) and 37 CFR 1.495(c)).				+
	Basic National Fee				\$ 1,000
	Fee for recording the enclosed assignment document \$40 (37 CFR 1.21(h)).				+
TOTAL	TOTAL FEES ENCLOSED				\$ 1,000

See attached Preliminary Amendment.

- [x] A check in the amount of \$1,000 to cover the basic filing fee is enclosed.
- [x] Please charge any additional basic filing fees under 37 CFR 1.492(a) which may be required by this paper, or credit any overpayment to Deposit Account No. 19-2560. This sheet is filed in duplicate.

Penelope Stockwell
Penelope Stockwell

09914886-010702

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Per SANDBERG

Art Unit:

Application No:

Examiner:

Filed:

For: COOLING ELEMENT FOR A HEAT EXCHANGER

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Please make the following amendments to this application prior to examination thereof.

AMENDMENTS

In the Claims:

Claims 3-9, cancel.

Add new claims as follows:

10. (New) Cooling element according to claim 1, characterized in that the cooling element is positioned to the contact area with the circulating element so that the contact area with the circulating element forms a shape of a straight line on its substantially whole length.

11. (New) Cooling element according to claim 1, characterized in that the cooling element is positioned so that the contact area with the circulating element forms a shape of a fraction line so that each part of the fraction line forms a substantially equal angle with the longitudinal direction of the circulating element.

12. (New) Cooling element according to claim 1, characterized in that the cooling element is made of copper.

13. (New) Cooling element according to claim 1, characterized in that the cooling element is made of copper-based alloy.

14. (New) Cooling element according to claim 1, characterized in that the cooling element is made of aluminum.

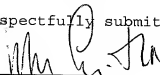
15. (New) Cooling element according to claim 1, characterized in that the cooling element is made of aluminum-based alloy.

16. (New) Cooling element according to claim 1, characterized in that the cooling element is a fin.

REMARKS

The above amendments are presented in order to place this application in better condition for examination.

Respectfully submitted,



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Docket: OUTO 2326

The invention relates to a cooling element provided with louvers to be used in a heat exchanger, particularly in a heat exchanger constructed so that the cooling element is under the influence of passing cooling medium, as air or water, used for cooling another medium flowing inside a circulating element and that the cooling element is used as a connecting member for two circulating elements.

In heat exchangers used in automotive industry for cooling a motor in a vehicle a fin is generally made of a corrugated strip. The corrugated strip itself is made of copper, copper-based alloy or aluminium or aluminium-based alloy and this corrugated strip is installed between circulating elements where medium to be cooled is circulated. The corrugated strip has a strong metallic bond with these circulating elements of medium to be cooled. The metallic bond is made by a braze or a solder material. One corrugated strip creates many cooling elements, fins, between circulating elements and the fins are provided with louvers for improving heat transfer capacity. Further, the fins positioned between two circulating elements are installed substantially perpendicularly to the longitudinal direction of the fin strip. When these kind of fins are cut in the middle between the two circulating elements, each individual fin has a number of louvers twisted at an angle of 20 to 45 degrees and grouped together in even numbers of different areas. Every odd area has the louvers at its angle and even areas at the opposite angle. The louvers are very small, from 0,75 to 1,5 millimetre, but the louvers are very efficient for the heat transfer capacity.

When cooling medium, as air or water, is passing the fins, cooling medium is forced to flow a flow pattern defined by the louvers. At low cooling medium flow levels the flow has in spite of louvers space enough to go directly through the fins. On the contrary, at moderate or high cooling medium flow levels the flow has to be redirected several times when passing the fins. This means more

costs because of energy loss and this effect can be measured as a higher pressure drop over the heat exchanger.

The object of the present invention is to eliminate some drawbacks of the prior art and to achieve a cooling element to be used in a heat exchanger, particularly in a heat exchanger where the cooling element, as a fin, is a connecting member between two circulating elements so that the redirections of a cooling medium as well as a pressure drop are substantially eliminated. The essential novel features of the invention are apparent from the appended claims.

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In accordance with the invention a cooling element, as a fin, in a heat exchanger is provided with louvers in order to improve heat transfer capacity in the heat exchanger. The fin is positioned between circulating elements of the heat exchanger so that a cooling medium, as air or water, passes the fin, and the fin will further cool the circulating elements where another medium to be cooled flows. The fin is bonded by a contact area on one edge to a circulating element, and the louvers form an angle with the surface of the fin. The fin is installed between the two circulating elements so that the fin forms essentially the same angle towards the longitudinal direction of the circulating element as the louvers form towards the surface of the fin. This kind of a fin arrangement eliminates redirections at moderate or high cooling medium flow levels, because the louvers are essentially in the same direction as the flow direction of the cooling medium when entering the heat exchanger. For high heat transfer capacity several fins are installed between two circulating elements.

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The fins are installed between circulating elements so that between the fins and the circulating element there is advantageously a strong bond made of a brazing or soldering material in the area where the fin and the circulating element have a contact with each other. The fins are installed so that at least on the contact area with the circulating elements the fins are advantageously essentially parallel to each other. In this contact area the fin forms an acute

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angle towards the longitudinal direction of the circulating element. The acute angle is in the range of 20 to 45 degrees, advantageously in the range of 25 to 35 degrees. The angle of the fin towards the longitudinal direction of the circulating element is dependent on the angle of the louvers to the surface of the fin.

5 This is because these two angles are substantially the same in largeness.

The fins can be positioned to the contact area with the circulating elements so that the contact area with the circulating elements forms a shape of a straight line on its substantially whole length. The fins can also be positioned so that the contact area with the circulating elements forms a shape of a fraction line so that each part of the fraction line forms an substantially equal angle towards the longitudinal direction of the circulating element.

The fins are advantageously created by a corrugated strip which is installed between two circulating elements so that the folds of the strip have alternately a contact with one circulating element. The strip is further positioned so that in the contact area between the fold and the circulating element the folds are substantial parallel to each other and the folds form an acute angle towards the longitudinal direction of the circulating element.

The fin can also be a flat plate which has a connection between several circulating elements. In that embodiment the louvers are installed between the circulating elements so that a flow of cooling medium goes through the louvers when passing the flat plate shaped as a fin.

The fins and the corrugated strip for a creation of the fins are advantageously made of copper, a copper-based alloy, aluminium or an aluminium-based alloy.

The invention is described in more detail with reference to the appended drawings, where

Fig. 1 is a schematical side-view illustration of fins in the prior art.

Fig. 2 is an illustration of Fig. 1 seen from the direction A-A,

Fig. 3 is a schematical and partial top-view illustration of one embodiment of the invention,

Fig. 4 is a schematical and partial top-view illustration of another embodiment of
5 the invention and

Fig. 5 is a schematical and partial top-view illustration of still another embodiment of the invention.

In accordance with Figs. 1 and 2 the fins 1 are positioned between two circulating
10 ing elements 2. The fins 1 are installed substantially perpendicular to the longitudinal direction 3 (shown as an arrow) of the circulating element 2. The fins 1 are provided with louvers 4. The louvers 4 will make curves for cooling medium passing the fins 1 shown as an arrow 6 for high cooling medium flow level, but not for low cooling medium flow level shown as an arrow 5.

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In Figs. 3a and 3b positions of louvers 12 in a fin 11 and the fin 11 to the longitudinal direction 13 (shown as an arrow) of a circulating element 14 are illustrated. An angle of a louver 12 to the longitudinal direction of the circulating element 14 is essentially equal to an angle of a fin 11 to the longitudinal direction
20 tion of the circulating element 14. The direction of the fin 11 is essentially the same in the essentially whole breadth 15 of the circulating element 14. The fins 11 are positioned substantially parallel to each other. The figure 3b illustrates the angle B of one individual fin 11 relating to the circulating element 14 and the angle C of one individual louver 12 relating to the surface of the fin 11.

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Fig. 4 illustrates an embodiment where a fin 21 with louvers 25 changes its direction to the longitudinal direction 22 (shown as an arrow) of a circulating element 23, but an angle to the circulating element 23 is essentially the same in the essentially whole breadth 24 of the circulating element 23.

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Figs. 5a and 5b illustrates an embodiment where several circulating elements 31 are installed on a flat fin plate 32. The flat fin plate 32 is provided with louvers 33 positioned between the circulating elements 31. Thus the flat fin plate 32 is positioned at the essentially same angle to the circulating elements 31 as the louvers 33 have to the surface of the flat fin plate 32. Fig. 5b is a view of the figure 5a seen from the direction D-D.

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CLAIMS

1. Cooling element provided with louvers to be used in a heat exchanger under the influence of passing cooling medium used for cooling another medium
- 5 flowing inside a circulating element whereto the cooling element is bond by a contact area on one edge, and the louvers form an angle with the surface of the cooling element, **characterised** in that the cooling element (1,11,21,32) is positioned so that the cooling element (1,11,21,32) forms an substantially equal angle (B) to the longitudinal direction of the circulating element (2,14,23,31) as
- 10 the louvers (4,12,25,33) form to the surface (C) of the cooling element (1,11,21,32).
2. Cooling element according to the claim 1, **characterised** in that the angle of the cooling element (1,11,21,32) to the longitudinal direction of the circulating
- 15 element (2,14,23,31) is in the range of 20 to 45 degrees.
3. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned to the contact area with the circulating element (2,14,23,31) so that the contact area with the circulating element
- 20 (2,14,23,31) forms a shape of a straight line on its substantially whole length.
4. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned so that the contact area with the circulating element (2,14,23,31) forms a shape of a fraction line so that each
- 25 part of the fraction line forms an substantially equal angle with the longitudinal direction of the circulating element (2,14,23,31).
5. Cooling element according to any of the preceding claims, **characterised** in that the cooling element (1,11,21,32) is a part of a corrugated strip which has a
- 30 contact area alternatively with two circulating elements (2,14,23,31).

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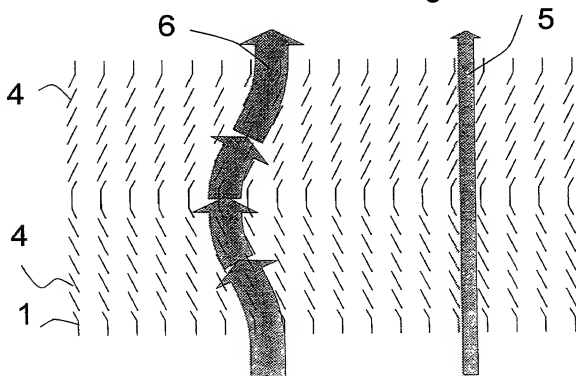
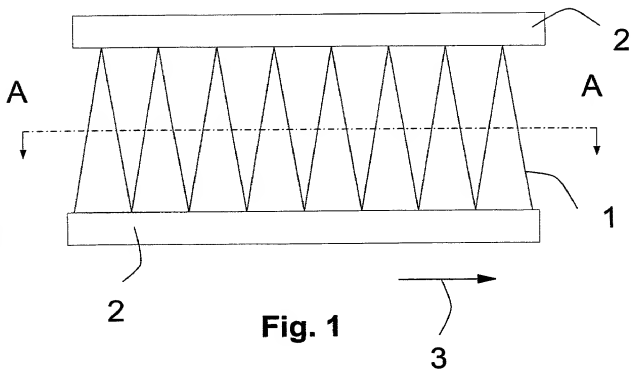
6. Cooling element according to any of the preceding claims, **characterised** in that the cooling element (1,11,21,32) is made of copper.

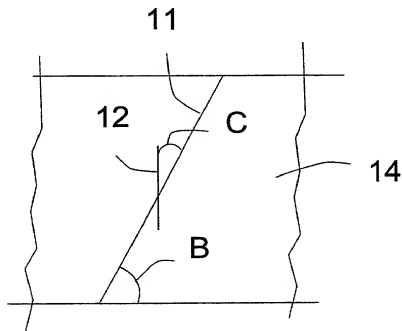
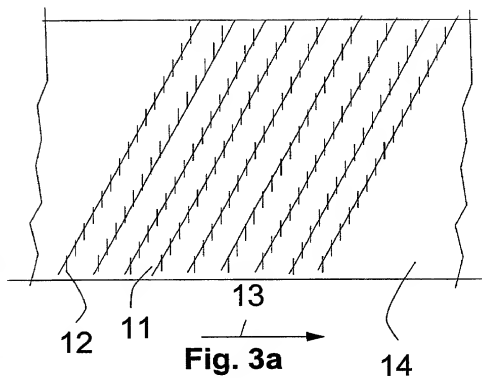
7. Cooling element according to any of the preceding claims 1 to 5, **character-**
5 **ised** in that the cooling element (1,11,21,32) is made of copper-based alloy.

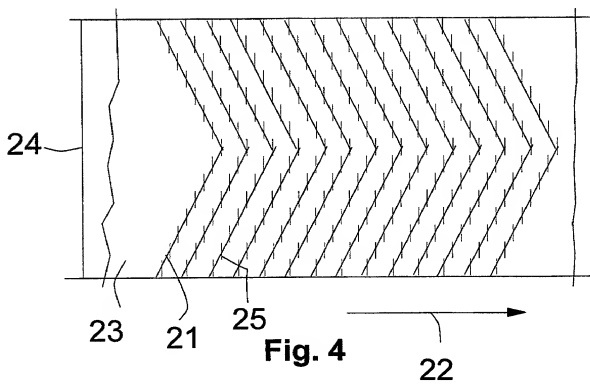
8. Cooling element according to any of the preceding claims 1 to 5, **character-**
ised in that the cooling element (1,11,21,32) is made of aluminium.

10 9. Cooling element according to any of the preceding claims 1 to 5, **character-**
ised in that the cooling element (1,11,21,32) is made of aluminium-based alloy.

10. Cooling element according to any of the preceding claims, **characterised** in that the cooling element (1,11,21,32) is a fin.







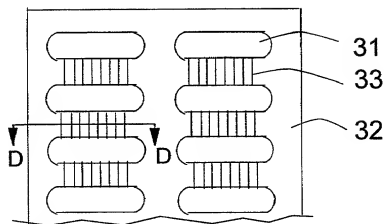


Fig. 5a

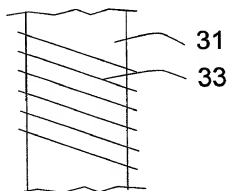


Fig. 5b

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DECLARATION FOR PATENT APPLICATION
(COMBINED WITH POWER OF ATTORNEY)
(ORIGINAL APPLICATION)

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

COOLING ELEMENT FOR A HEAT EXCHANGER

the specification of which is attached hereto unless box (a) or (b) is checked, in which case

- (a) ☐ the specification was filed on _____ as Application No. _____.
- (b) ☒ the specification was filed as PCT International Application No. PCT/FI00/00145 filed on 23 February 2000 and was amended under PCT Art. 19 on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

I have identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America and filed less than 12 months (6 months for designs) prior to this United States application and of which I claim foreign priority benefits under Title 35, United States Code, Sec. 119, and I have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

EARLIEST FOREIGN APPLICATION, AND ALL FOREIGN APPLICATIONS FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

<u>Country</u>	<u>Application No.</u>	<u>Date of Filing</u> (month/day/year)
<u>Finland</u>	<u>990576</u>	<u>03/16/1999</u>
_____	_____	_____
_____	_____	_____

27
As a named inventor, I hereby appoint the practitioners associated with **Customer Number 007812** (John Smith-Hill, Reg. No. 27,730 and Daniel J. Bedell, Reg. No. 30,156) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent.

Send correspondence to the correspondence address associated with **Customer Number 007812**.

I hereby authorize the practitioners that I have appointed to accept instructions regarding this application and the resulting patent from OUTOKUMPU OYJ.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Title 18, United States Code, Sec. 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00 Full name of sole or first joint inventor _____

Per SANDBERG
Inventor's signature _____

Date 09/24/2001 Country of Citizenship Sweden

Residence Västerås, Sweden SEX

Post Office Address Zimmermansgatan 12

S-722 19 Västerås, Sweden

Full name of second joint inventor, if any _____

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____

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